WHAT IS CLAIMED IS:

1. A recording method for an optical disk, which is used for an optical disk in which concave and convex areas formed as concave and convex sections on the disk substrate are arranged along a track with constant intervals and a recording area for recording data of a predetermined number of units n (n: natural number) is placed between the concave and convex areas arranged with constant intervals, comprising the steps of:

forming a first two-dimensional array by adding addition data to input data;

forming a second two-dimensional array in which the length of each row is set to m (m: natural number) with a $\times$ m = b $\times$ n (a, b: natural numbers) being satisfied, by carrying out a plurality of error-correction encoding processes, including at least an error-correction encoding process that forms a code sequence by using a data alignment in a diagonal direction of the first two-dimensional array, on the first two-dimensional array; and

successively sending data on each row in the second two-dimensional array so that all the data in the second two-dimensional array is recorded on the recording area on the optical disk.

2. The recording method for an optical disk as defined

in claim 1, wherein an addition code having a length satisfying the equation $a \times m = b \times n$ (a, b: natural numbers) in the second two-dimensional array is added to each row of the second two-dimensional array.

3. The recording method for an optical disk as defined in claim 1, wherein: supposing that the number of data related to one logical sector is l byte (l: natural number greater than m), $l = c \times m$ (c: natural number) is satisfied and supposing that the minimum combination of a and b that satisfies $a \times m = b \times n$ are a_{min} and b_{min}, a_{min} is set to a divisor of c that is smaller than c.

4. A recording method for an optical disk, which is used for an optical disk in which concave and convex areas formed as concave and convex sections on the disk substrate are arranged along a track with constant intervals and a recording area for recording data of a predetermined number of units n (n: natural number) is placed between the concave and convex areas arranged with constant intervals, comprising the steps of:

forming a first two-dimensional array by adding addition data to input data;

forming a third two-dimensional array having the number of data contained in one row that does not exceed

the number of rows by carrying out an error-correction encoding process on the first two-dimensional array by using a code sequence constituted by a data alignment in a diagonal direction so as to add a row constituted by a first encoding parity to the first two-dimensional array;

forming a second two-dimensional array in which the length of each row is set to m (m: natural number) with a $\times$ m = b $\times$ n (a, b: natural numbers) being satisfied by carrying out an error-correction encoding process on the third two-dimensional array by using a code sequence constituted by a data alignment in a row direction so as to add a second encoding parity to the third two-dimensional array; and

successively sending data on each row in the second two-dimensional array so that all the data in the second two-dimensional array is recorded on the recording area on the optical disk.

5. The recording method for an optical disk as defined in claim 4, wherein an addition code having a length satisfying the equation a $\times$ m = b $\times$ n (a, b: natural numbers) in the second two-dimensional array is added to each row of the second two-dimensional array.

6. The recording method for an optical disk as defined

in claim 4, wherein: supposing that the number of data related to one logical sector is l byte (l: natural number greater than m), $l = c \times m$ (c: natural number) is satisfied and supposing that the minimum combination of a and b that satisfies $a \times m = b \times n$ are a_{min} and b_{min}, a_{min} is set to a divisor of c that is smaller than c.

7. A recording method for an optical disk, which is used for an optical disk in which concave and convex areas formed as concave and convex sections on the disk substrate are arranged along a track with constant intervals and a recording area for recording data of a predetermined number of units n (n: natural number) is placed between the concave and convex areas arranged with constant intervals, comprising the steps of:

forming a first two-dimensional array by adding addition data to input data;

forming a second two-dimensional array by carrying out a single error-correction encoding process or a plurality of error-correction encoding processes which form code sequences by using data alignments in respectively different directions of the first two-dimensional array on the first two-dimensional array; and

successively sending data on the respective rows in the second two-dimensional array while exchanging the data

so as to record a parity generated in at least any one of the error-encoding processes on a portion adjacent to the concave and convex areas in the recording area, thereby recording all the data in the second two-dimensional array on the recording area on the optical disk.

8. The recording method for an optical disk as defined in claim 7, further comprising the step of:

carrying out on the first two-dimensional array a plurality of error-correcting encoding processes including an error-correction encoding process that forms a code sequence by using a data alignment in a recording direction of data onto the optical disk in the second two-dimensional array,

wherein a parity, which has been generated in an error-correction encoding process that forms a code sequence by using a data alignment in a recording direction of data on the optical disk in the second two-dimensional array, is recorded on the portion adjacent to the concave and convex areas in the recording area.

9. The recording method for an optical disk as defined in claim 7, further comprising the step of:

carrying out a plurality of error-correcting encoding processes on the first two-dimensional array,

wherein a parity, formed by the error-correction encoding process having a short minimum distance of codes among the plurality of error encoding processes, is preferentially recorded on the portion adjacent to the concave and convex areas in the recording area.

10. The recording method for an optical disk as defined in claim 7, wherein the second two-dimensional array has a length of each row that is set to m (m: natural number), with $a \times m = b \times n$ (a, b: natural numbers) being satisfied.

11. The recording method for an optical disk as defined in claim 10, wherein an addition code having a length satisfying the equation $a \times m = b \times n$ (a, b: natural numbers) in the second two-dimensional array is added to each row of the second two-dimensional array.

12. The recording method for an optical disk as defined in claim 10, wherein: supposing that the number of data related to one logical sector is l byte (l: natural number greater than m), $l = c \times m$ (c: natural number) is satisfied and supposing that the minimum combination of a and b that satisfies $a \times m = b \times n$ are a_{min} and b_{min}, a_{min} is set to a divisor of c that is smaller than c.

13. An optical disk recording apparatus, which records information on an optical disk in which concave and convex areas formed as concave and convex sections on the disk substrate are arranged along a track with constant intervals and a recording area for recording data of a predetermined number of units n (n: natural number) is placed between the concave and convex areas arranged with constant intervals, comprising:

encoding means for forming a first two-dimensional array by adding addition data to input data, for carrying out a plurality of error-correction encoding processes on the first two-dimensional array, the encoding processes including at least an error-correction encoding process that forms a code sequence by using a data alignment in a diagonal direction of the first two-dimensional array, and for forming a second two-dimensional array in which the length of each row is set to m (m: natural number) with a $\times$ m = b $\times$ n (a, b: natural numbers) being satisfied;

modulation means for successively modulating data in each row in the second two-dimensional array; and

recording means for recording the modulated data on the recording area of the optical disk.

14. An optical disk recording apparatus, which records information on an optical disk in which concave and convex

areas formed as concave and convex sections on the disk substrate are arranged along a track with constant intervals and a recording area for recording data of a predetermined number of units n (n: natural number) is placed between the concave and convex areas arranged with constant intervals, comprising:

encoding means for forming a first two-dimensional array by adding addition data to input data, for carrying out a single error-correction encoding process or a plurality of error-correction encoding processes which form code sequences by using data alignments in respectively different directions of the first two-dimensional array on the first two-dimensional array so that a second two-dimensional array is formed;

modulation means for carrying out a data modulation while exchanging the data so as to record a parity generated in at least any one of the error-encoding processes on a portion adjacent to the concave and convex areas in the recording area; and

recording means for recording the modulated data on the recording area of the optical disk.

15. An optical disk reproducing apparatus, which reproduces information from an optical disk in which concave and convex areas formed as concave and convex sections on

the disk substrate are arranged along a track with constant intervals and a recording area for recording data of a predetermined number of units n (n: natural number) is placed between the concave and convex areas arranged with constant intervals, the optical disk being provided with an arrangement in which: a first two-dimensional array is formed by adding addition data to input data, a plurality of error-correction encoding processes, including at least an error-correction encoding process that forms a code sequence by using a data alignment in a diagonal direction of the first two-dimensional array, are carried out on the first two-dimensional array, a second two-dimensional array in which the length of each row is set to m (m: natural number) with $a \times m = b \times n$ (a, b: natural numbers) being satisfied is formed, and data on each row in the second two-dimensional array is sent so that all the data in the second two-dimensional array is recorded on the recording area on the optical disk, comprising:

reproducing means for reading data from the recording area;

demodulation means for demodulating data read by the reproducing means;

arranging means for arranging the demodulated data from the demodulation means into the second two-dimensional array; and

decoding means for carrying out decoding processes on the plurality of error-correction encoding processes with respect to the data arranged in the second two-dimensional array.

16. An optical disk reproducing apparatus, which reproduces information from an optical disk in which concave and convex areas formed as concave and convex sections on the disk substrate are arranged along a track with constant intervals and a recording area for recording data of a predetermined number of units n (n: natural number) is placed between the concave and convex areas arranged with constant intervals, the optical disk being provided with an arrangement in which: a first two-dimensional array is formed by adding addition data to input data, a single error-correction encoding process or a plurality of error-correction encoding processes which form code sequences by using data alignments in respectively different directions of the first two-dimensional array on the first two-dimensional array are carried out so that a second two-dimensional array is formed, and data is successively recorded while exchanging the data in each row in the second two-dimensional array so as to record a parity generated in at least any one of the error-encoding processes on a portion adjacent to the concave and convex areas in

the recording area, comprising:

reproducing means for reading data from the recording area;

demodulation means for demodulating data read by the reproducing means;

arranging means for successively arranging the demodulated data from the demodulation means into the second two-dimensional array, while exchanging positions of the parities; and

decoding means for carrying out decoding processes on the error-correction encoding processes with respect to the data arranged in the second two-dimensional array.

17. An optical disk, comprising:

concave and convex areas that are formed as concave and convex sections on the disk substrate and arranged along a track with constant intervals; and

a recording area for recording data of a predetermined number of units n (n: natural number) that is placed between the concave and convex areas arranged with constant intervals,

wherein: a first two-dimensional array is formed by adding addition data to input data, a plurality of error-correction encoding processes, including at least an error-correction encoding process that forms a code

sequence by using a data alignment in a diagonal direction of the first two-dimensional array, are carried out on the first two-dimensional array so that a second two-dimensional array in which the length of each row is set to m (m: natural number) with a × m = b × n (a, b: natural numbers) being satisfied is formed, and data on each row in the second two-dimensional array is successively recorded in the second two-dimensional array so that all the data in the second two-dimensional array is recorded on the recording area on the optical disk.

18. An optical disk, comprising:

concave and convex areas that are formed as concave and convex sections on the disk substrate, and arranged along a track with constant intervals; and

a recording area for recording data of a predetermined number of units n (n: natural number) that is placed between the concave and convex areas arranged with constant intervals,

wherein: a first two-dimensional array is formed by adding addition data to input data, a single error-correction encoding process or a plurality of error-correction encoding processes which form code sequences by using data alignments in respectively different directions of the first two-dimensional array on the first two-

dimensional array are carried out so that a second two-dimensional array is formed, and data is successively recorded while exchanging the data in each row in the second two-dimensional array so as to record a parity generated in at least any one of the error-encoding processes on a portion adjacent to the concave and convex areas in the recording area, so that all the data in the second two-dimensional array is recorded.